Selenium Aquatic Life Criteria

Criterion Element	Magnitude	Duration	Frequency
Fish Tissue[a] (Egg-Ovary)[b]	15.1 mg/kg dw	Instantaneous measurement[c]	Not to be exceeded
Fish Tissue[a] (Whole Body or Muscle)[d]	8.5 mg/kg dw or 11.3 mg/kg dw muscle (skinless, boneless filet)	Instantaneous measurement[c]	Not to be exceeded
Water Column[e] (Monthly Average Exposure)	1.5 µg/L in lentic aquatic systems 3.1 µg/L in lotic aquatic systems	30 days	Not more than once in three years on average
Water Column[e] (Intermittent Exposure)[f]	$WQC_{int} = \frac{WQC_{30\text{-}day} - C_{bkgrnd}(1 - f_{int})}{f_{int}}$	Number of days/month with an elevated concentration	Not more than once in three years on average

[a] Fish tissue elements are expressed as steady-state.

[b] Egg/ovary supersedes any whole-body, muscle, or water column element when fish egg/ovary concentrations are measured.

[c] Fish tissue data provide point measurements that reflect integrative accumulation of selenium over time and space in fish population(s) at a given site.

[d] Fish whole-body or muscle tissue supersedes water column element when both fish tissue and water concentrations are measured.

[e] Water column values are based on dissolved total selenium in water and are derived from fish tissue values via bioaccumulation modeling. Water column values are the applicable criterion element in the absence of steady-state condition fish tissue data.

[f] Where $WQC_{30\text{-}day}$ is the water column monthly element, for either a lentic or lotic waters; C_{bkgrnd} is the average background selenium concentration, and f_{int} is the fraction of any 30-day period during which elevated selenium concentrations occur, with f_{int} assigned a value ≥ 0.033 (corresponding to 1 day).

Original Risked-Based Equation used from "Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories Volume 2 Risk Assessment and Fish Consumption Limits Third Edition": 3.2.2.1 pg. 3-7

$$CRlim = \frac{RfD \times BW}{Cm}$$

Where:

CR_{lim} = maximum allowable fish consumption rate (kg/d)
RfD = reference dose Se (mg/kg-d) = 0.005
BW = consumer body weight (kg) = 80
C_m = measured concentration of chemical contaminant *m* in a given species of fish (mg/kg)

To convert the dry weight to a wet weight CR_{lim} the following equation was used:

$$CRlim = \frac{RfD \times BW}{Cm \times Wt}$$

Where:

CR_{lim} = maximum allowable fish consumption rate (kg/d)
RfD = reference dose Se (mg/kg-d) = 0.005
BW = consumer body weight (kg) = 80
C_m = measured concentration of chemical contaminant *m* in a given species of fish (mg/kg)
Wt = dry weight to wet weight conversion factor = 0.3 (assuming a 30% solids value).

If we use the 304(a) muscle aquatic life criteria of 11.3 mg/kg (dry weight) in the formula, the CR_{lim} would be 117.99 g/day (wet). This is less than the Tribes' proposed fish consumption limit of 175 g/day.

Above equation solving for C*m*:

$$Cm = \frac{RfD \times BW}{CRlim \times Wt}$$

Where:

CR_{lim} = maximum allowable fish consumption rate (kg/d)= .175 kg/d
RfD = reference dose Se (mg/kg-d) = 0.005
BW = consumer body weight (kg) = 80
C_m = measured concentration of chemical contaminant *m* in a given species of fish (mg/kg)
Wt = dry weight to wet weight conversion factor = 0.3 (assuming a 30% solids value).

If we solve the equation using the Tribes' 175 g/day (.175 kg/d) we get an acceptable Cm of 7.61 mg/kg (dry weight) fish tissue.